Final Project – CMS 330 Operating Systems
PCB Structures – Kyle Bennett, Isabella Nieto
Rollins College – Dr. Valerie Summet – Spring 2021
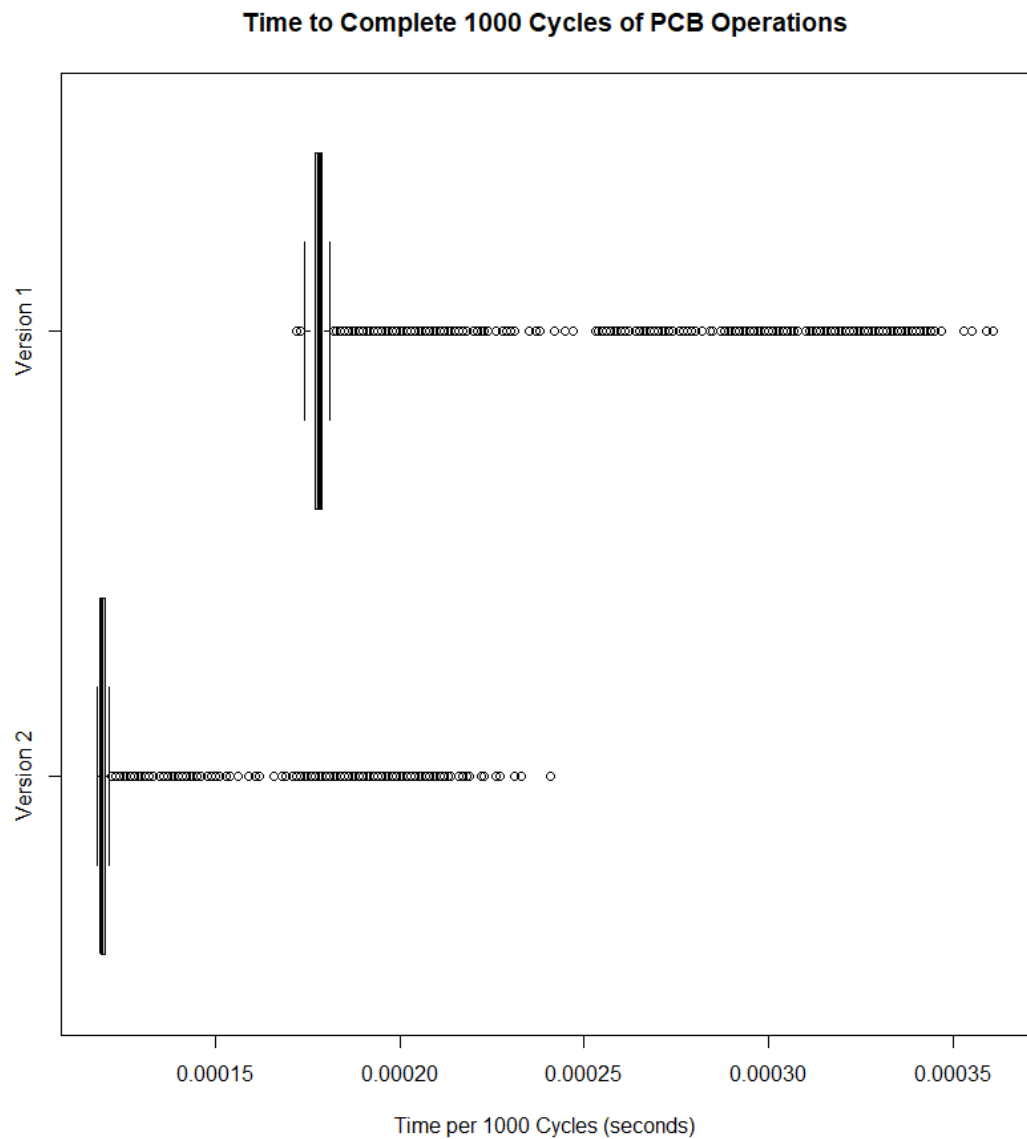
- Definitions
    - Version 1: PCB structure designed using linked lists
    - Version 2: PCB structure designed avoiding linked lists
- Test
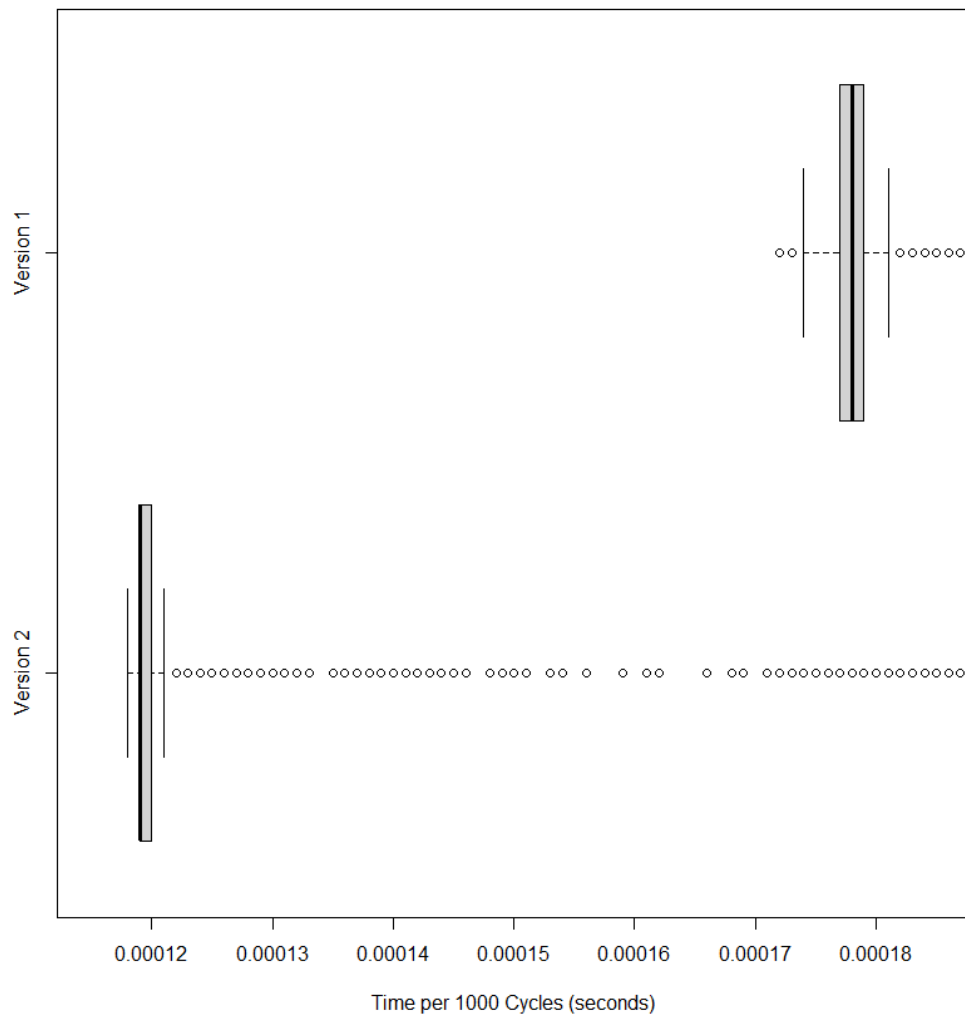   - Each version was ran with the following instructions
        create(0);   /* creates 1st child of PCB[0] at PCB[1] */
        create(0);   /* creates 2nd child of PCB[0] at PCB[2] */
        create(2);   /* creates 1st child of PCB[2] at PCB[3] */
        create(0);   /* creates 3rd child of PCB[0] at PCB[4] */
        destroy(0); /* destroys all descendants of PCB[0] */
    - Each cycle was then repeated a 1,000 times then recorded as a data point for each version. Therefore each single data point represents 1,000 cycles through the above five operations
    - That cycle repeated 10,000 time to create 10,000 data points for per version for a total of 20,000 data points between both version combined. Additionally, from taking all of the data points in a single version it represents 10,000,000 cycles through the above five instructions.
    - All of the data points were outputted into a text file before being copied into an excel document loaded in to RStudio to perform the below statistical analysis
- Mean:
    - Version 1: 0.0001812282 seconds
    - Version 2: 0.0001211636 seconds
    - Difference: Version 2 is on average 0.000060065 seconds faster per 1000 cycles than Version 1
- Median:
    - Version 1: 0.000178 seconds
    - Version 2: 0.000119 seconds
    - Difference: The median of Version 2 is 0.000059 seconds lower than version 1
- Five number summary
    - Version 1:
        - Min: 0.0001720 seconds
        - 1st Quartile: 0.0001770 seconds
        - Median: 0.0001780 seconds
        - 3rd Quartile: 0.0001790 seconds
        - Max: 0.0003610 seconds
    - Version 2:
        - Min: 0.0001180
        - 1st Quartile: 0.0001190 seconds
        - Median: 0.0001190 seconds
        - 3rd Quartile: 0.0001200 seconds
        - Max: 0.0002410 seconds

- Boxplots

Time to Complete 1000 Cycles of PCB Operations

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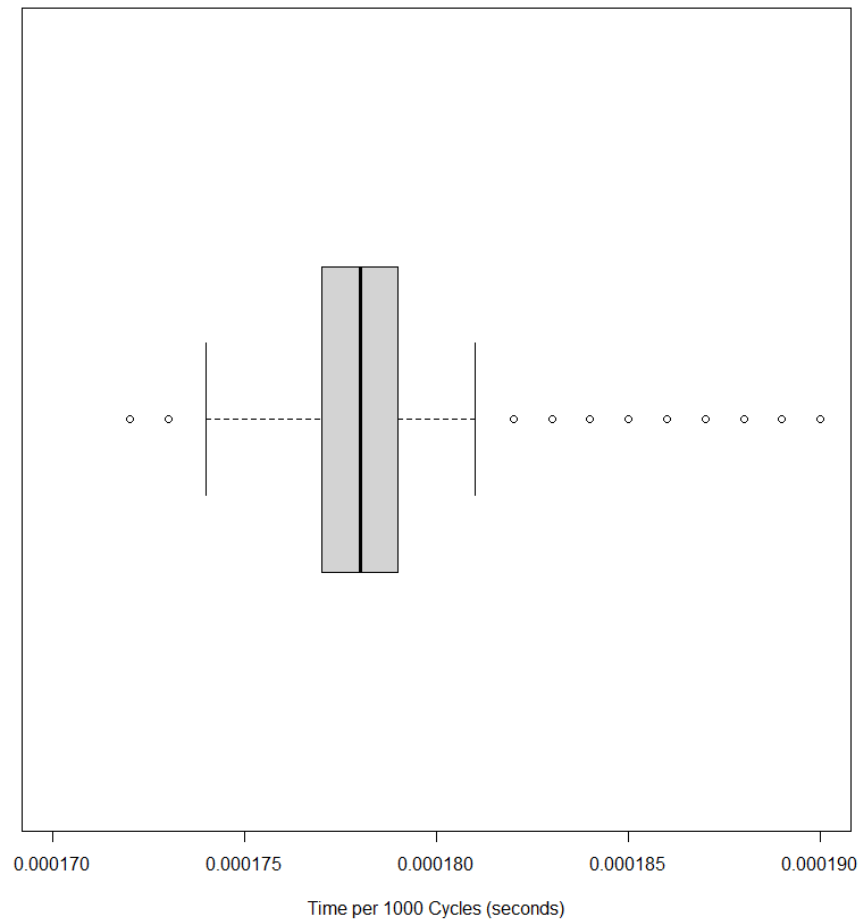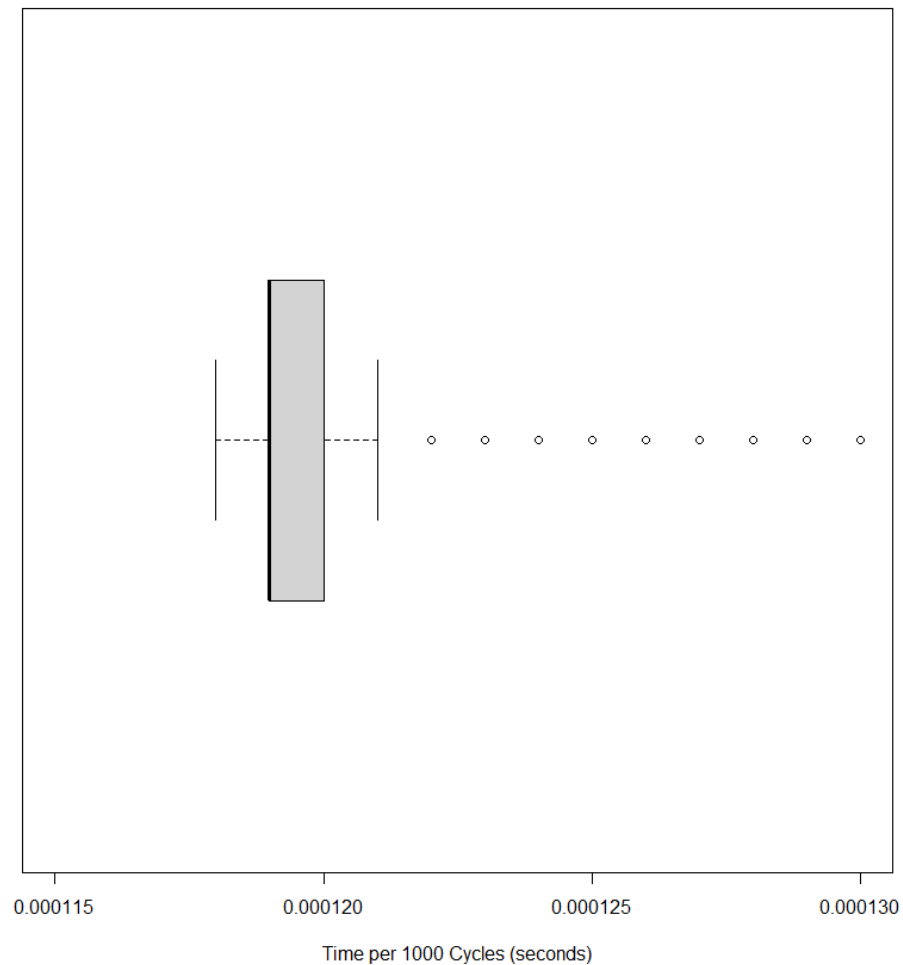Rollins College – Dr. Valerie Summet – Spring 2021

Time to Complete 1000 Cycles of PCB Operations (Zoomed in to show 0.00012-0.00018)

Version 1: Time to Complete 1000 Cycles of PCB Operations (Zoomed in)

Time per 1000 Cycles (seconds)

Version 2: Time to Complete 1000 Cycles of PCB Operations (Zoomed in)

Time per 1000 Cycles (seconds)

- o
- Analysis
    - o The tests provided enough data points and measurements that are distinct enough from one another in order to begin drawing conclusions and observations. Overall, by all measurements the 2nd version that avoided linked lists and having to use dynamic memory operated much faster, smoother and more consistently than version 1 did. One highlight of the smoothness of version 2 is that there exists no meaningful difference between the 25th and 50th percentiles, allowing for a more consistent operation. Additionally, the maximum outlier from version 2 is significantly closer to the outlier marker and 75th percentile than in version 1, also holding no minimum outlier. Lastly, the interquartile range for version 2 (0.000001 second) compared to the IQR of version 1 (0.000184 seconds) combined with all the other aforementioned data points highlights the overall consistency able to be achieved by version 2 over that of version 1. Additionally, version 2 being able to operate at an on average 0.000060065 seconds per 1,000 cycles faster speed than version 1 also renders it superior in the time range due to

it being less intensive on the machine. Overall, the second version avoiding the use of linked lists and by extension dynamic memory in both of the key categories of speed and consistency renders it the preferable choice.